

ARMOUR

VOLUME 9

THEORY OF ARMOURED GUNNERY

PART 3

COUGAR APPLICATION OF FIRE

(ENGLISH)

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1-1 to 1-10.....	0	6-1 to 6-2.....	0
2-1 to 2-2.....	0	7-1 to 7-9.....	0
2-3 to 2-5.....	1	7-10 to 7-11.....	1
2-6 to 2-9.....	0	7-12	0
2-10 to 2-12.....	1	8-1 to 8-5/8-6.....	0
2-13 to 2-14.....	0	9-1 to 9-3	0
3-1 to 3-7/3-8	0	9-4 to 9-5	1
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FOREWORD

1. B-GL-305-009/PT-003 Armour, Volume 9, Theory of Armoured Gunnery, Part 3, COUGAR Application of Fire, is issued on the authority of the Chief of the Defence Staff.
2. B-GL-305-009/PT-003 is effective on receipt and supersedes all previous editions.
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CONTENTS

CHAPTER 1 - GENERAL PRINCIPLES

INTRODUCTION

AIM

SCOPE

ASSOCIATED PUBLICATIONS

GENERAL PRINCIPLES

BASIC TECHNIQUES AND VARIATIONS

ENGAGEMENT PROCEDURE

TECHNIQUES OF ENGAGEMENT

CHAPTER 2 - HIGH EXPLOSIVE SQUASH HEAD (HESH) DIRECT SHOOTING UP TO 2000 M

GENERAL

INTRODUCTION

CORRECTIONS AVAILABLE TO THE GUNNER

CORRECTIONS AVAILABLE TO THE COMMANDER

MAXIMUM EFFECTIVE RANGES

LOADING DUTIES

STATIC TARGET TECHNIQUE

SITUATION

TECHNIQUE

SURPRISE TARGET TECHNIQUE

SITUATION

TECHNIQUE

INCONSPICUOUS TARGETS

SITUATION

TECHNIQUE - GUNNER IDENTIFIES THE TARGET

TECHNIQUE - GUNNER FAILS TO IDENTIFY THE TARGET AFTER DETAILED DESCRIPTION

TECHNIQUES OF FIRE - RADNIS

GENERAL

DAY MODE

NIGHT MODE

EXAMPLE FIRE ORDERS

HESH DIRECT (500 m TO 2000 m) STATIC TARGETS

CHAPTER 3 - MACHINE-GUN SHOOTING

GENERAL

INTRODUCTION

MAXIMUM EFFECTIVE RANGES

CORRECTIONS AVAILABLE TO THE GUNNER

CORRECTIONS AVAILABLE TO THE COMMANDER
LENGTH OF BURST
STATIC TARGET TECHNIQUE
SITUATION
TECHNIQUE
TECHNIQUES OF FIRE - RADNIS
GENERAL
DAY MODE
NIGHT MODE
EXAMPLE FIRE ORDERS
MACHINE-GUN STATIC TARGET TECHNIQUE

CHAPTER 4 - HESH SEMI-INDIRECT SHOOTING

GENERAL
INTRODUCTION
ESTABLISHING INITIAL LINE
POSITION OF THE TARGET IN RELATION TO THE ARMoured FIGHTING VEHICLE
ESTABLISHING INITIAL ELEVATION
POSITION OF THE ARMoured FIGHTING VEHICLE
FIRE ORDERS
CORRECTIONS
FIRE FOR EFFECT
SEMI-INDIRECT SIGHT TECHNIQUE
SITUATION
TECHNIQUE
SEMI-INDIRECT NON-SIGHT TECHNIQUE
SITUATION
TECHNIQUE
SEMI-INDIRECT TURRET DOWN TECHNIQUE
SITUATION
TECHNIQUE
EXAMPLE OF FIRE ORDERS
HESH SIGHT TECHNIQUE

CHAPTER 5 - SMOKE SHOOTING

GENERAL
INTRODUCTION
FACTORS AFFECTING SEMI-INDIRECT SHOOTING
PRINCIPLES OF SMOKE SHOOTING
FUSE SETTING
CORRECTIONS
SMOKE SCREEN AT CLOSE RANGE USING THE MULTI-BARREL SMOKE GRENADE
DISCHARGERS SMOKE SIGHT TECHNIQUE
SITUATION

TECHNIQUE
SMOKE NON-SIGHT TECHNIQUE
SITUATION
TECHNIQUE
SMOKE TURRET DOWN TECHNIQUE
SITUATION
TECHNIQUE
MAIN ARMAMENT EMERGENCY SMOKE
SITUATION
TECHNIQUE
EXAMPLE FIRE ORDERS
EMERGENCY SMOKE TECHNIQUE

CHAPTER 6 - CANISTER SHOOTING

GENERAL
INTRODUCTION
MAXIMUM EFFECTIVE RANGE
CANISTER SHOOTING
SITUATION
TECHNIQUE
EXAMPLE FIRE ORDERS
CANISTER SHOOTING

CHAPTER 7 - SHOOTING AT MOVING TARGETS AND SHOOTING ON THE MOVE

GENERAL
INTRODUCTION
SHOOTING AT MOVING TARGETS
INTRODUCTION
RULES FOR AIMING
RANGE LIMITATIONS
CORRECTION OF FIRE
SHOOTING ON THE MOVE
INTRODUCTION
RULES FOR AIMING
RANGE LIMITATION
CORRECTION OF FIRE
LOADING DUTIES
HESH SHOOTING AT MOVING TARGETS
SITUATION
TECHNIQUE
MG SHOOTING AT MOVING TARGETS
SITUATION
TECHNIQUE
MACHINE-GUN SHOOTING ON THE MOVE

SITUATION
TECHNIQUE
EXAMPLE FIRE ORDERS
HESH - MOVING TARGETS

CHAPTER 8 - SHOOTING ON FIXED LINES

GENERAL
INTRODUCTION
REGISTRATION
FIXED LINE SHOOTING
SITUATION
TECHNIQUE
EXAMPLE FIRE ORDERS
HESH - FIXED LINE (BALLISTIC GRATICULE AND QFC REGISTRATION)

CHAPTER 9 - TROOP SHOOTING

GENERAL
GENERAL
FIRE DISCIPLINE
POSITION OF ARMoured FIGHTING VEHICLES
TROOP SHOOTING
DELIBERATE ENGAGEMENT
QUICK-ACTION ENGAGEMENT
DISTRIBUTION OF FIRE
EXAMPLE FIRE ORDERS
DELIBERATE ENGAGEMENT
REFERENCES

LIST OF FIGURES

FIGURE	TITLE
Figure 1-1	Day Sight Graticule Pattern - All Sights
Figure 1-2	Explanatory Diagram for the Day Sight Graticule Pattern - All Sights
Figure 1-3	Radnis Night Graticule Pattern

CHAPTER 1

GENERAL PRINCIPLES

INTRODUCTION

1. Techniques of shooting provide drills to assist crews in the application of fire from their armoured fighting vehicle (AFV). The techniques also take into account the various factors affecting the weapon system under specific engagement conditions. Whenever possible, techniques are standardized and follow a set pattern.
2. Continuous development and improvement introduce further techniques for crews to learn. However, if the basic principles are understood, crews should have little difficulty in operating the weapons efficiently. Frequent review and practice on both the indoor miniature range (IMR) and the open range will help in maintaining a high standard of proficiency.

AIM

3. The aim of this publication is to describe the application of fire and the techniques of shooting from the COUGAR.

SCOPE

4. The General Principles section of this chapter deals with the general principles which apply to all techniques used with the COUGAR. Subsequent chapters describe the individual techniques for each type of weapon and ammunition; they conclude with example fire orders.

ASSOCIATED PUBLICATIONS

5. A list of references related to this manual is contained in Annex A.

GENERAL PRINCIPLES

BASIC TECHNIQUES AND VARIATIONS

6. There are seven basic techniques of shooting which can be applied from the COUGAR; with each basic technique there are a number of variations. The basic techniques are:
 - a. High Explosive Squash Head (HESH) direct shooting (static targets);
 - b. coaxial machine-gun (MG) shooting (static targets);
 - c. HESH semi-indirect shooting;
 - d. smoke shooting;

- e. canister shooting;
 - f. shooting at moving targets; and
 - g. shooting on fixed lines.
7. Variations of these techniques depend upon the range to the target and whether or not the gunner can see the target. The reasons the gunner may not see the target are:
- a. inconspicuous target;
 - b. conditions of poor visibility;
 - c. damaged gunner's sight; or
 - d. turret-down fire position.

ENGAGEMENT PROCEDURE

8. The basic principles of shooting are described in B-GL-305-009/PT-001, Armour, Volume 9, Theory of Armoured Gunnery, Part 1, General. An engagement follows the pattern described below.
- a. **Spotting and Identifying the Target.** This is mainly the responsibility of the commander, although the other members of the crew must assist him whenever possible. High standards of visual and AFV recognition training are needed.
 - b. **Choice of Weapon/Ammunition and Technique.** The type of target, the range to it and type of result required will determine the choice of weapon/ammunition and technique.
 - c. **Fire Orders.** All fire orders for direct fire engagements and semi-indirect sight techniques contain the following information and are given in the following order (a glossary of terms used in crew drills is included in B-GL-305-009/PT-001):
 - (1) **Weapon/ammunition designator** - "HESH", "CO-AX", "SMOKE" or "CANISTER".

NOTE

For HESH engagements, the commander will order "LASING HESH" if a hand-held laser is used to determine the range.

- (2) **Range** - Initial range is given in metres, eg, "ONE TWO HUNDRED".

- (3) **Target Description** is as follows:
- (a) Targets are described as briefly as possible using the standard target descriptions used in B-GL-305-009/PT-001, eg, "ANT", "TANK", etc. Inconspicuous targets will require a more precise target description and a more accurate lay.
 - (b) The exceptions to this indication process are semi-indirect, non-sight and turret-down techniques (see the basic differences of technique which appear below).
 - (c) If the target is moving, or the vehicle is firing on the move, the direction of aim-off is ordered after gun alignment.
 - (d) Once the gunner has identified the target, he informs the commander by reporting "ON".
- (4) **Alignment of the gun** - The commander has the facilities to align the gun using his controller sight. He may also direct the gunner for line by ordering him to traverse left or right using the following commands:
- (a) "TRAVERSE LEFT/RIGHT" - gunner traverses quickly;
 - (b) "TRAVERSE STEADY LEFT/RIGHT" - gunner traverses slowly;
 - (c) "STEADY" - gunner slows down from fast to slow traverse; and
 - (d) "ON" - gunner stops traversing.
- (5) **The order to fire** - The commander gives this command by ordering "LOADED, FIRE". Before subsequent 76 mm rounds can be fired, the gunner must wait for the commander to report "LOADED". This report means that the commander has loaded the main armament and has made the loader's safety switch.

Semi-indirect techniques vary in sequence and format. The basic differences are:

- (1) **Sight Technique:**
- (a) After the gunner reports "ON", the commander orders "SET ANGLE OF SIGHT".
 - (b) The gunner sets the angle and reports "SET".

- (c) The commander repeats the range and the gunner responds accordingly. He reports "LEVEL" when the bubble on the quadrant fire control (QFC) has been levelled.

(2) **Non-Sight Technique:**

- (a) Alignment of the gun comes immediately after the designation of weapon/ammunition.
- (b) An angle of sight (or "ZERO SCALES") is ordered after alignment.
- (c) The initial range is ordered after the angle of sight.
- (d) There is no target description.

(3) **Turret-Down Technique:**

- (a) "TURRET-DOWN" precedes the designation of weapon/ammunition.
- (b) Alignment of the gun comes immediately after the designation of weapon and ammunition.
- (c) An angle of sight (or "ZERO SCALES") is ordered after alignment.
- (d) The initial range is ordered after the angle of sight.
- (e) There is no target description.

d. **Gun Laying.** The following applies:

- (1) The sight graticule pattern for the gunner's and commander's sights is illustrated in Figures 1-1, 1-2 and 1-3.
- (2) In all cases during direct fire, the correct point of aim is taken by placing the appropriate aiming mark on the centre of the visible mass of the target. Care must be taken not to include shadow as part of the mass.
- (3) When using the elevating hand-wheel, the lay must always be finished in depression. The movement of the handwheel should be at least one quarter of a turn to take up any backlash in the elevating gear.
- (4) When the gunner engages a moving target (after he has applied his point of aim) he must continue to track the target maintaining this correct point of

aim at all times. This must be continued while pressing the firing switch or foot pedal.

- (5) When firing using the semi-indirect technique, the gun is laid for line using the traverse indicator and for elevation using the QFC.
- e. **Firing.** Once the order to fire has been given and the sight has been laid on the target (or, when firing using the semi-indirect technique, the correct line and elevation are applied), the gunner will report "FIRING NOW" and will fire the weapon immediately. Firing on the move is the only exception to this rule. Here it is permissible to pause after saying "FIRING NOW" if the point of aim is not on the target (see Chapter 7).
- f. **Re-laying After Firing.** When the gun has been fired, the commander and the gunner must observe the effects of the round. The sight must be re-laid onto the target using the previous point of aim. Corrections required are then applied from this point of aim.

TECHNIQUES OF ENGAGEMENT

- 9. Techniques of engagement differ according to the type of ammunition and the circumstances of the engagement. Chapters 2 to 8 describe the individual techniques.

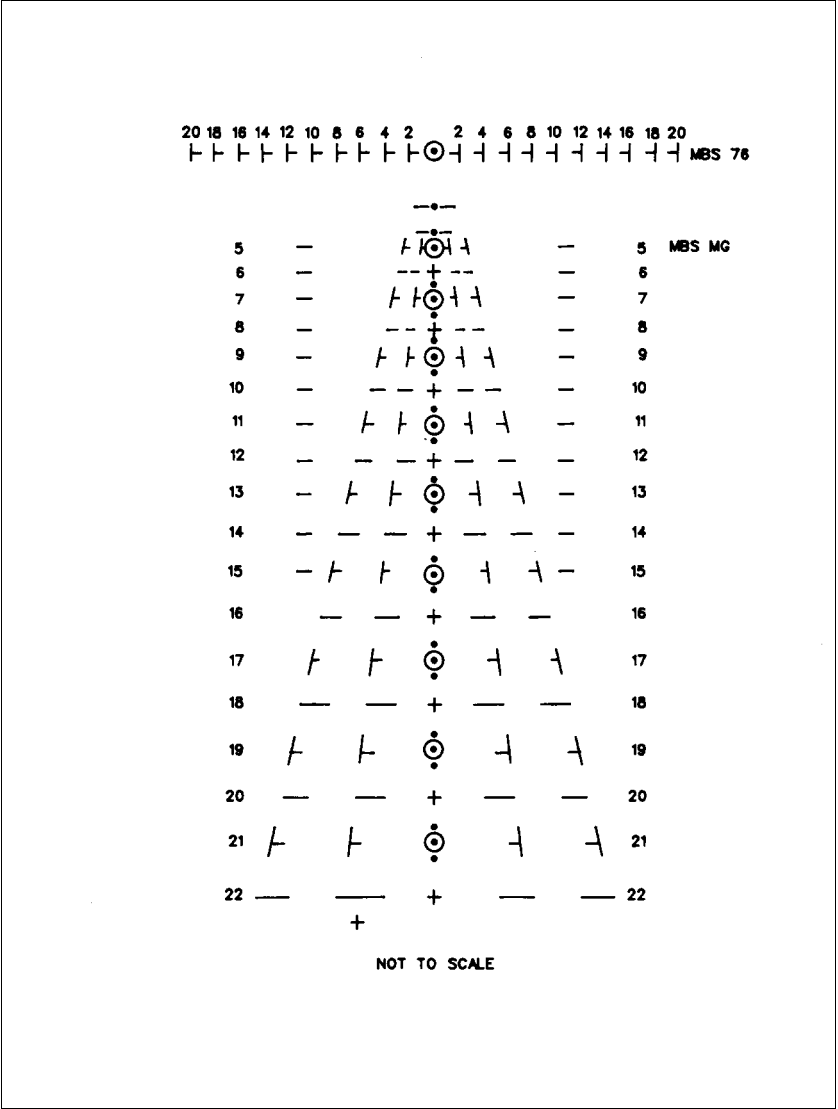


Figure 1-1 Day Sight Graticule Pattern - All Sights

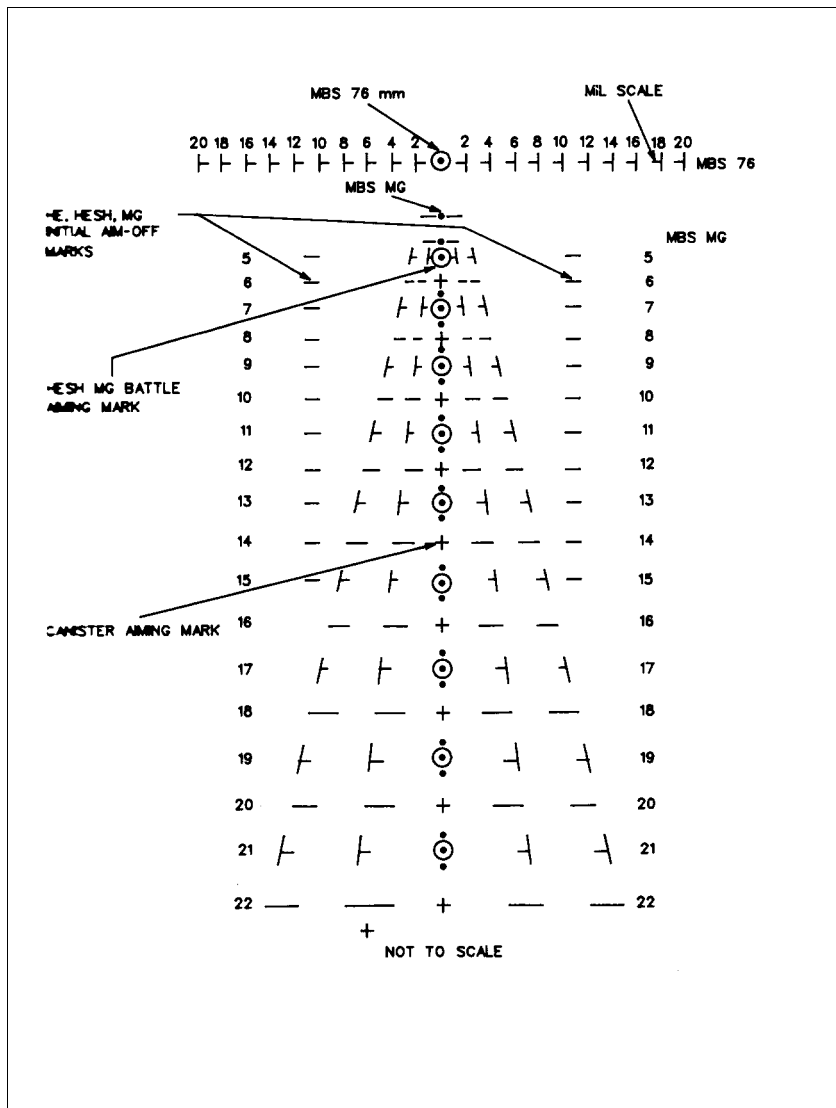


Figure 1-2 Explanatory Diagram for the Day Sight Graticule Pattern - All Sights

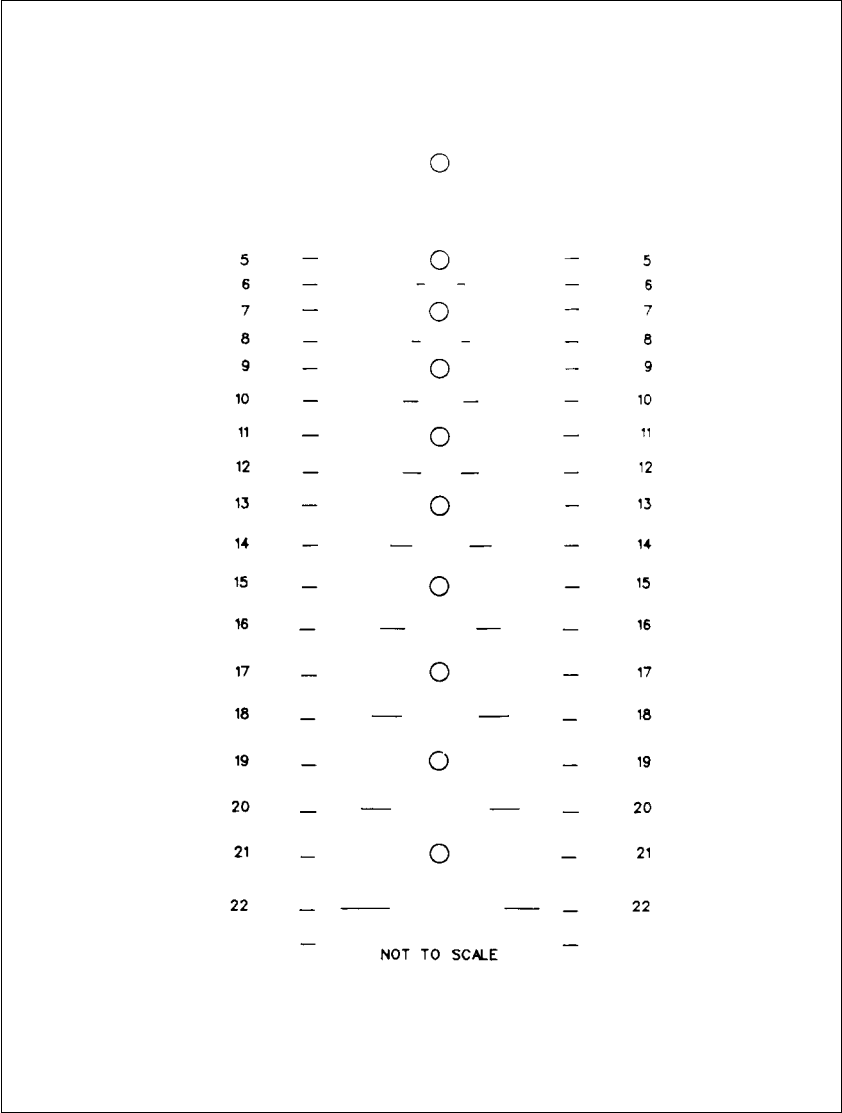


Figure 1-3 Radnis Night Graticule Pattern

CHAPTER 2

HIGH EXPLOSIVE SQUASH HEAD (HESH) DIRECT SHOOTING UP TO 2000 M

GENERAL

INTRODUCTION

1. This chapter covers all aspects of HESH direct shooting up to 2000m, under daylight conditions, when using white light or indirect illumination and when using Radnis day/night sight.
2. The commander determines the range to the target. The gunner, using the ballistic graticule, applies the initial range ordered by the commander and fires. If the target is hit and destroyed, the engagement is stopped. If the target is hit but not destroyed, further rounds may be fired using the same point of aim. If the first or subsequent rounds miss the target, the gunner applies corrections and reports them to the commander.

CORRECTIONS AVAILABLE TO THE GUNNER

3. All HESH direct shooting employs the principle of observation and correction of fire. The gunner observes and corrects his own fire, using the following corrections and limitations:
 - a. **Burst on Target (BOT) Correction.** The following applies:
 - (1) Line is reported first and is followed by elevation.
 - (2) Under 500 m the BOT correction is the usual elevation correction.
 - (3) The BOT correction is not used over 500 m until the 50 m correction has been employed.
 - b. **Standard Correction.** This is a fixed correction of 100 m or 200 m depending upon how the initial elevation is obtained:
 - (1) 200 m correction may be used at any range (500-2000 m).
 - (2) 100 m correction (the normal initial correction from 500 m to 1000 m).
 - (3) 100 m correction (the initial correction from 1000 m to 2000 m if a hand-held laser is used to determine range).
 - (4) 200 m correction (the initial correction from 1000 m to 2000 m if range is estimated).

- (5) Reapply the correction until the target is straddled.
 - (6) Once a straddle is achieved successfully, halve the correction down to 50 m in the direction of the target.
 - c. **Gunner's Combined Correction.** (BOT for line and standard correction). All limitations apply.
4. Should a target be grazed, or when an area target is engaged, the gunner may correct to achieve a more central hit or to distribute his fire. He would report "TARGET LEFT", "TARGET ADD", etc.
5. The gunner reports all corrections to the commander. Examples of corrections are:
- a. "RIGHT";
 - b. "ADD TWO HUNDRED",
 - c. "DROP FIFTY"
 - d. "LEFT AND DROP TWO HUNDRED"; or
 - e. "RIGHT AND ADD".

CORRECTIONS AVAILABLE TO THE COMMANDER

6. Although the gunner usually corrects for direct fire, it may be necessary for the commander to step in and take over the shoot if:
- a. the gunner fails to observe the fall of shot and reports "NOT OBSERVED"; or
 - b. the commander disagrees with the gunner's intended correction; or
 - c. when a round falls outside the scope of corrections available to the gunner.
7. In the cases above, the commander takes over the shoot by ordering "STOP". He follows this by the correction he wants applied. If he wants to hand control back to the gunner, he then orders "LOADED, GO ON". However, should the commander wish to keep control of the shoot and apply subsequent corrections himself, he orders "LOADED FIRE".
8. The corrections that are available to the commander and their limitations are listed as follows:
- a. **Commander's Line Correction.** This is measured with the sight or binoculars and is applied to the traverse indicator by the gunner.

- b. **Commander's Elevation Correction.** This is the initial correction which may be of 50 m or any multiple of 100 m.
- c. **Target Size Corrections.** The following limitations apply:
 - (1) maximum of three target widths for line;
 - (2) maximum of one target height for elevation;
 - (3) used only against well-defined targets; and
 - (4) one-half target corrections may be used only if the target has been struck on the top, side or bottom.
- d. **Commander's Combined Correction.** The commander may use any combination of the above with the same limitations.

NOTE

If the crew commander agrees with the gunner's reported line correction but not with the reported elevation corrections, the crew commander may repeat the gunner's line correction followed by the desired elevation correction.

- 9. Examples of commander's corrections are:
 - a. "STOP, LEFT ONE ZERO, LOADED, GO ON/FIRE";
 - b. "STOP, ADD ONE HUNDRED, LOADED, GO ON/FIRE";
 - c. "STOP, RIGHT TWO TARGETS, ADD ONE TARGET, LOADED, GO ON/FIRE";
 - d. "STOP, LEFT ONE FIVE, DROP FIFTY, LOADED, GO ON/FIRE"; and
 - e. "STOP, LEFT ONE FIVE, DROP ONE TARGET, LOADED, GO ON/FIRE".
- 10. In the interest of speed, and if the target is well defined, the commander should use target size corrections for line.
- 11. It is particularly important that commanders be alert to the need to step in and take over the shoot, particularly when the initial range is estimated. If rounds fall outside the limits of the gunner's corrections, ammunition may be wasted by "creeping" onto the target unless the commander steps in and orders a bold correction.

12. Commanders are cautioned however, not to overcontrol their gunners as direct fire is usually best corrected by the gunner.

MAXIMUM EFFECTIVE RANGES

13. As the ballistic graticule is graduated to only 2200 m, this is the maximum range of engagement possible with HESH. However, in order to allow for possible range estimation errors and the fact that aim off marks go up to only 1500 m, the maximum engagement ranges are limited to:

- a. 2000 m - for static targets;
- b. 1500 m - for moving targets (aim off required); and
- c. 2000 m - for moving targets (aim off not required).

LOADING DUTIES

14. When the commander gives the order "HESH", he will load a round of HESH. He reloads with HESH after observing the fall of shot and continues to load until he orders "TARGET", "STOP".

15. The loading drill is:

- a. load the main armament;
- b. make the loader's safety switch; and
- c. report "LOADED".

16. Base clips will remain in place until the round is loaded.

STATIC TARGET TECHNIQUE

SITUATION

17. The commander wishes to engage a stationary target with HESH for which the range is 2000 m or less.

TECHNIQUE

18. The commander gives a fire order designating weapon/ammunition, range and target description then aligns the gun and reports "ON".

19. The gunner repeats the range, selects "MAIN", identifies the target and reports "ON".

20. The commander loads the main armament, makes the loader's safety switch and reports "LOADED, FIRE".
21. The gunner lays the appropriate aiming mark on the centre of the visible mass of the target, reports "FIRING NOW" and fires.
22. The gunner re-lays and observes the fall of shot. If the target is hit, he reports "TARGET". If the commander considers that the target is killed, he orders "TARGET, STOP". Should the commander consider, that although hit, the target is not killed, he reloads the gun and reports "LOADED". The gunner fires again at the same lay until the commander orders "STOP".
23. If the target is not hit, the gunner reports his intended correction and continues to apply corrections until the target is hit or the commander orders "STOP".
24. If the commander agrees with the corrections reported by the gunner, he remains silent; if he disagrees, he orders "STOP" and gives his own correction followed by either "LOADED", "fire" or "LOADED, GO ON".
25. The gunner, upon hearing the command "STOP", re-lays with his last point of aim, repeats the commander's correction, applies it, and, after receiving the order "LOADED, FIRE" or "LOADED, GO ON", he reports "FIRING NOW" and fires.
26. When engaging more than one target at the same range, the commander orders "TARGET ... NEXT TARGET RIGHT/LEFT ... LOADED, GO ON/FIRE". The gunner reports "ON" when he identifies the target. He lays on the new target with whatever point of aim he used to hit the previous one. The gunner reports "FIRING NOW" and fires.
27. If the new target is outside the gunner's field of view the commander aligns the gun with the new target (or orders the gunner to traverse left or right) and reports "ON". The gunner reports "ON" when he has identified the new target and the commander orders "LOADED, FIRE/GO ON".
28. The commander ends the shoot by ordering "TARGET, STOP" or "STOP".

SURPRISE TARGET TECHNIQUE

SITUATION

29. The commander is confronted with a surprise target at close range (500 m or less) and he wishes to engage with HESH.

TECHNIQUE

30. The commander gives a fire order designating weapon/ ammunition, target description, aligns the gun and reports "ON".

31. The gunner selects "MAIN", identifies the target and reports "ON".
32. The commander loads a HESH round, makes the loader's safety switch and reports "LOADED, FIRE".
33. The gunner lays onto the target with the HESH battle aiming mark (HESH 500), reports "FIRING NOW" and fires.
34. Observation of the fall of shot at short ranges may be difficult or even impossible due to obscuration and the short time of flight. Subsequent rounds may be fired at the commander's discretion.

INCONSPICUOUS TARGETS

SITUATION

35. The commander wishes to engage a target for which the range is less than 2000 m and gives a fire order. The gunner, however, cannot observe the target (due to obscuration, camouflage or any other reason) and reports "NOT OBSERVED".
36. The commander must then use a more detailed target description and a reference point from which the gunner can make a line switch onto the target. The gunner may then be able to observe the target or he may still not be able to identify it. The following techniques take each situation into account.

TECHNIQUE - GUNNER IDENTIFIES THE TARGET

37. The commander gives a fire order designating weapon/ ammunition, range and target description then aligns the gun and reports "ON".
38. The gunner repeats the range, selects "MAIN", but fails to identify the target and reports "NOT OBSERVED".
39. The commander orders "STOP" and picks a prominent object close to the same horizontal plane as the target. He either orders the gunner to traverse onto it or aligns the gun with his controller and then describes it, eg, "STOP, TRAVERSE RIGHT ... ON, BASE ON LARGE TREE".
40. The gunner identifies the prominent object and reports "ON". He then lays onto the object using the mark on his graticule that corresponds with the range, eg, if the range was 1400 m, he would lay the 1400 mark on the object (i.e., base of a large tree). Having laid onto the object, the gunner zeroes his traverse indicator.
41. The commander then measures the line switch between the prominent object and the target then orders this to the gunner, e.g., "LEFT ONE FIVE".

42. The gunner repeats the line switch and traverses in the direction and the amount ordered. If the gunner identifies the target, he reports "ON".

43. The shoot continues as a normal static engagement.

TECHNIQUE - GUNNER FAILS TO IDENTIFY THE TARGET AFTER DETAILED DESCRIPTION

44. Having applied the line switch from the prominent object, the gunner fails to identify the target and reports "NOT OBSERVED". The commander loads and reports "LOADED, FIRE". The gunner lays onto the point where he thinks the target is and fires. The commander retains control of the shoot, ordering corrections until the target is destroyed or identified by the gunner. The gunner reports he has identified the target by reporting "ON".

TECHNIQUES OF FIRE - RADNIS

GENERAL

45. The methods used by the commander and gunner to engage targets with HESH using the SS125 and SS126 Radnis Day/Night sights are similar to those employed using the No. 71 and No. 54 sights.

DAY MODE

46. When employing the day mode of operation, all techniques of engagement used by the commander and gunner are the same as when the No. 71 and No. 54 sights are used.

NIGHT MODE

47. When employing the night mode of operation, the application of fire is the same as for daylight techniques. However, the commander and gunner must be aware of the following points peculiar to the night mode of operation:

- a. the maximum range under ideal conditions is considered to be 1400 m;
- b. due to the excellent ability of Radnis to indicate fall of shot, the gunner will employ BOT corrections only; and
- c. as the night graticule is graduated in increments of 100 m, the minimum elevation correction available to the commander is 100 m.

EXAMPLE FIRE ORDERS

HESH DIRECT (500 m TO 2000 m) STATIC TARGETS

48. Lasing Techniques.

Commander:

"LASING HESH, ONE TWO HUNDRED,
TANK IN OPEN ... ON"

"LOADED FIRE"

"LOADED"

"LOADED"

"TARGET STOP"

Gunner:

"ONE TWO HUNDRED ... ON"

"FIRING NOW ... LEFT AND
ADD ONE HUNDRED"

"FIRING NOW ... DROP FIFTY"

"FIRING NOW ... TARGET"

49. Estimated Technique (below 1000 m).

Commander:

"HESH, EIGHT HUNDRED,
APC IN OPEN ... ON"

"LOADED ... FIRE"

"LOADED"

FIFTY"

"LOADED"

"TARGET STOP"

Gunner:

"EIGHT HUNDRED ... ON"

"FIRING NOW ... LEFT AND
ADD ONE HUNDRED"

"FIRING NOW... DROP

"FIRING NOW...TARGET"

50. **Estimated Technique (over 1000 m).**

Commander:

"HESH, ONE NINE HUNDRED, TANK
IN HEDGE ROW ... ON"

"LOADED FIRE"

"LOADED"

"LOADED"

"LOADED"

"TARGET STOP"

**HESH INCONSPICUOUS TARGET (GUNNER IDENTIFIES)
(0 m TO 2000 m)**

Commander:

"HESH, ONE SIX HUNDRED, TANK IN"

"HEDGE ROW ... ON"

"STOP, TRAVERSE LEFT...ON, LARGE TREE"

"RIGHT ONE FIVE"

"LOADED, FIRE"

"TARGET, STOP"

Gunner:

"ONE NINE HUNDRED ... ON"

"FIRING NOW ... RIGHT AND
DROP TWO HUNDRED"

"FIRING NOW ... ADD ONE
HUNDRED"

"FIRING NOW ... DROP FIFTY"

"FIRING NOW...TARGET"

Gunner:

"ONE SIX HUNDRED ... NOT
OBSERVED"

"ON"

"RIGHT ONE FIVE ... ON"

"FIRING NOW"

"TARGET"

HESH INCONSPICUOUS TARGET (GUNNER DOES NOT IDENTIFY) (0 m TO 2000 m)

52. "HESH, ONE FOUR HUNDRED, TANK"

"IN WOODLINE ... ON"

"ONE FOUR HUNDRED ... NOT
OBSERVED"

"STOP, TRAVERSE LEFT ... ON,
RIGHT EDGE OF GATE"

"ON"

"RIGHT TWO FIVE"

"RIGHT TWO FIVE ... NOT
OBSERVED"

"LOADED, FIRE"

"FIRING NOW"

"LEFT FIVE, ADD ONE HUNDRED"

"LEFT FIVE, ADD ONE
HUNDRED"

"LOADED, FIRE"

"FIRING NOW"

"DROP FIFTY"

"DROP FIFTY"

"LOADED FIRE"

"FIRING NOW"

"TARGET, LOADED, FIRE"

"TARGET, FIRING NOW"

"STOP"

CHAPTER 3

MACHINE-GUN SHOOTING

GENERAL

INTRODUCTION

1. Direct shooting using the coaxially mounted machine-gun (MG) is similar in principle to the technique for firing HESH at static targets. This chapter deals with MG shooting against stationary targets under daylight conditions, when using white light or indirect illumination and when using Radnis day/night sights.
2. As with direct HESH shooting, the gunner is responsible for observation and correction of fire, with the commander being prepared to step in and order corrections if necessary. The same rules apply for the use of the orders "GO ON" and "FIRE" after a correction by the commander.

MAXIMUM EFFECTIVE RANGES

3. The normal maximum range of engagement is 1100 m since this is the range at which the tracer element usually burns out. However, when an MG barrel becomes hot through sustained firing, the tracer will burn out earlier. Accurate observation of fire must be obtained from the fall of shot on the ground. In exceptional circumstances, such as very dry and dusty conditions, the strike of bullets on the ground may be observed at ranges in excess of tracer burn-out.

CORRECTIONS AVAILABLE TO THE GUNNER

4. Once the gunner has identified and laid on to the target, he fires a ranging burst when ordered by the commander. If the ranging burst is on target, the gunner fires killing bursts as necessary. If the ranging burst misses the target, the gunner applies corrections to hit the target. Under no circumstances will he "hose-pipe" onto the target (altering line and elevation while firing the MG).
5. The corrections available to the gunner and their limitations are as follows:
 - a. **Burst on Target Correction:**
 - (1) line is reported first, and
 - (2) up to tracer burn-out, this is the usual correction.
 - b. **Standard Correction:**
 - (1) it may be used at any range,

- (2) it should be the initial elevation correction beyond tracer burn-out,
 - (3) once it has been applied, the gunner may:
 - (a) go directly to a BOT correction if he is able to assess the fall of shot as being close to the target, or
 - (b) if a straddle has not been achieved and the fall of shot is not close to the target, reapply the standard correction.
 - c. **Gunner's Combined Correction** (BOT for line and standard correction). All limitations apply.
6. The gunner reports each correction to the commander. Examples are:
- a. "RIGHT"
 - b. "ADD";
 - c. "LEFT AND DROP";
 - d. "ADD TWO HUNDRED"; or
 - e. "RIGHT AND DROP TWO HUNDRED".
7. The gunner reports "FIRING NOW" for every burst.
8. Aiming marks are:
- a. under 500 m - HESH 500 m mark; and
 - b. over 500 m - normal HESH marks equivalent to the range ordered.

CORRECTIONS AVAILABLE TO THE COMMANDER

9. As in HESH shooting, the commander may step in and order corrections if:
- a. the gunner reports "NOT OBSERVED";
 - b. the commander disagrees with the gunner's intended correction; or
 - c. the fall of shot is outside the scope of corrections available to the gunner.

10. The corrections available to the commander are as for HESH. They are as follows:

- a. commander's line correction;
- b. commander's elevation correction;
- c. target size corrections; and
- d. commander's combined correction.

11. Once the commander has ordered a correction, he may order "FIRE" if he wants to retain control of the shoot, or "GO ON" if he wants to hand control of the shoot back to the gunner.

LENGTH OF BURST

12. The length of burst depends on the requirement to observe fire during ranging and the desired effect on the target once the range is established. The nature of the ground and visibility will influence the length of burst and, although no rigid rule can be given, the following are guidelines.

- a. **Ranging** (using the standard load of four ball/one tracer (4B/1T):
 - (1) up to tracer burn-out - a short burst of two tracer, and
 - (2) beyond tracer burn-out - a long burst of four tracer.
- b. **Killing:**
 - (1) up to tracer burn-out:
 - (a) small targets or personnel gone to ground - a short burst of two tracer, and
 - (b) large targets or personnel in open - a long burst of four tracer.
 - (2) Beyond tracer burn-out, killing bursts should be long.
- c. **Speculative Fire.** If speculative fire is used on areas likely to conceal enemy positions, a short burst of two tracer should be fired at irregular intervals.

STATIC TARGET TECHNIQUE

SITUATION

13. The commander wishes to engage a static target with the coaxial MG.

TECHNIQUE

14. The commander gives a fire order designating weapon/ammunition, range, target description, aligns the gun and reports "ON".
15. The gunner repeats the range, selects "CO-AX", and identifies the target, reporting "ON". He lays onto the target with the appropriate HESH mark on his sight graticule and awaits the commander's order to fire. (if the range is less than 500 m, the 500 m mark will be used as the initial point of aim.)
16. The commander loads the coaxial MG, and reports "LOADED, FIRE".
17. The gunner reports "FIRING NOW" and fires a ranging burst. He observes the trace or fall of shot and, if the target is hit, reports "TARGET".
18. If the commander considers the target killed, he orders "TARGET, STOP". However, if the commander considers that although hit, the target is not killed, he will remain silent allowing the gunner to fire again at the same lay.
19. If the target is not hit, the gunner reports his intended correction and continues to apply corrections until the target is hit or the commander orders "STOP".
20. If the commander agrees with the corrections reported he remains silent. If he disagrees, he orders "STOP" and then gives his own correction followed by either "LOADED, FIRE" or "LOADED, GO ON".
21. The gunner, upon hearing the command "STOP", relays with his last point of aim. He repeats the commander's correction, applies it, and after receiving the order "LOADED FIRE" or "LOADED GO ON", the gunner reports "FIRING NOW" and fires.
22. If the target is large the gunner must traverse his fire through the target (reporting the direction before firing).
23. The commander ends the shoot by ordering "TARGET, STOP" or "STOP".

TECHNIQUES OF FIRE - RADNIS

GENERAL

24. The methods used by the commander and gunner to engage targets with the coaxially mounted MG using the SS 125 and SS 126 Radnis Day/Night Sights are similar to those employed using the No. 71 and No. 54 sights.

DAY MODE

25. When employing the day mode of operation, all techniques of engagement used by the commander and gunner are the same as when the No. 71 and No. 54 sights are used.

NIGHT MODE

26. When employing the night mode of operation the application of fire is the same as for daylight techniques. However, the commander and gunner must be aware of the following points peculiar to the night mode of operations:

- a. maximum range will be to tracer burn-out;
- b. due to the excellent ability of Radnis to indicate fall of shot, the gunner will employ BOT corrections only; and
- c. as the night graticule is graduated in increments of 100m, the minimum elevation correction available to the commander is 100m.

EXAMPLE FIRE ORDERS

MACHINE-GUN STATIC TARGET TECHNIQUE

Commander:

"CO-AS, SIX HUNDRED, MEN ... ON"

"LOADED, FIRE"

"TARGET, STOP"

Gunner:

"SIX HUNDRED ON"

"FIRING NOW"

"LEFT AND ADD FIRING NOW...
TARGET..."

"FIRING NOW TARGET"

CHAPTER 4

HESH SEMI-INDIRECT SHOOTING

GENERAL

INTRODUCTION

1. This chapter covers HESH semi-indirect shooting. Semi-indirect shooting means that either a target is being engaged beyond the range of the sight graticule or that the gunner cannot see the target but the commander can. To cover each situation, semi-indirect shooting is categorized into three techniques:

- a. **Sight Technique.** This is employed when:
 - (1) the gunner can initially see the target, and
 - (2) the range to the target is greater than 2000 m.
- b. **Non-Sight Technique.** This is employed when:
 - (1) the gunner cannot see the target for any of the following reasons:
 - (a) inconspicuous target beyond 2000 m,
 - (b) poor visibility, or
 - (c) damage to the gunner's sight; and
 - (2) the range may be any distance up to 5000 m.
- c. **Turret-Down Technique.** This is employed at any range when the gunner cannot see the target because the vehicle is in a turret-down fire position.

2. Semi-indirect fire is affected by four factors that must be considered by the commander. These factors are:

- a. establishing the initial line of the gun;
- b. the position of the target in relation to the armoured fighting vehicle (AFV);
- c. establishing the initial elevation of the gun; and
- d. the position of the AFV.

ESTABLISHING INITIAL LINE

3. **Sight Technique.** Initial line is established by the gunner laying onto the target with the main battle sight (MBS) 76 mark in the sight graticule.
4. **Non-Sight and Turret-Down Technique.** When the gunner cannot see the target, the commander must establish the initial line. This is accomplished by:
 - a. the commander looking through his sight and using his traverse controller; or
 - b. the commander looking along the gun barrel and ordering the gunner to traverse left or right until line is established.
5. The key to recording the line of the gun is the traverse indicator. This becomes the only record of where the gun was laid when a round was fired and is the only accurate means of applying line corrections.
6. The gunner must ensure that:
 - a. once the gun has been initially laid for line, he zeroes the traverse indicator by using the adjusting knobs;
 - b. after each round is fired, he re-lays for line by zeroing the traverse indicator using the adjusting knobs; and
 - c. when a line correction has been applied, he again zeroes the traverse indicator by using the adjusting knobs.

POSITION OF THE TARGET IN RELATION TO THE ARMOURED FIGHTING VEHICLE

7. If the target is above or below the AFV, it means that there is an angle of sight. In order to apply accurate elevation, the angle of sight must be considered by the commander before the engagement commences. The commander may accomplish this in the following ways:
 - a. measure it,
 - b. calculate it, or
 - c. allow for it.
8. **Measuring the Angle of Sight.** When the sight technique is used, the angle of sight is measured by the gunner on the command "SET ANGLE OF SIGHT". The procedure is:
 - a. the gunner lays onto the target with MBS 76;

- b. the range drum adjuster is unlocked;
- c. the bubble in the QFC is levelled by rotating the range drum adjuster (the reading on the mils scale directly below the cursor line is the angle of sight);
- d. the HESH/HE scale is slipped until the zero mark is directly below the cursor line (ensuring that the mils scale is not disturbed);
- e. the range drum adjuster is securely locked (ensuring that the mils scale is not disturbed); and
- f. the gunner reports "SET".

9. **Calculating the Angle of Sight.** When using the non-sight and turret-down techniques, the angle of sight can be calculated. The commander, using his map, finds the difference in height and range between his own position and the target. He calculates the angle of sight using the following formula:

$$\begin{array}{lcl} \text{Angle of Sight} & = & \frac{\text{Difference in height (m)}}{\text{Range (in thousands of m)}} \\ \text{(Mils)} & & \end{array}$$

Example:

Target elevation - 270 m

Own vehicle elevation - 230 m

Range - 3500 m

$$\begin{array}{lcl} \text{Angle of Sight} & - & \frac{270 - 230}{3.5} \end{array}$$

$$= \frac{40}{3.5}$$

$$= 11.4 \text{ mils elevation.}$$

The commander orders "ANGLE OF SIGHT ONE ONE ELEVATION".

10. **Applying an Angle of Sight.** Once the commander has ordered an angle of sight, the gunner applies it by:

- a. unlocking the range drum adjuster;
- b. rotating the range until the ordered angle of sight is directly below the cursor line;

- c. slipping the HESH/HE scale until the zero mark is directly below the cursor line (ensuring that the mils scale is not disturbed);
- d. securely locking the range drum adjuster (ensuring that the mils scale is not disturbed); and
- e. reporting "SET".

11. **Allowing for an Angle of Sight.** Having determined the initial range, the commander adds (or subtracts if the target has a negative angle of sight) 1000 m to the range. He then orders "ZERO SCALES" followed by the new range. This is a very inaccurate method and should be used only in an emergency.

12. **"ZERO SCALES".** This is ordered by the commander if there is no angle of sight or if he wishes to allow for one. Upon hearing this order, the gunner:

- a. unlocks the range drum adjuster;
- b. rotates the range drum until the zero marks on all scales are directly below the cursor line;
- c. securely locks the range drum adjuster; and
- d. reports "SCALES ZEROED".

ESTABLISHING INITIAL ELEVATION

13. The range to the target must be established by the most accurate means possible. A laser range-finder should be used at all times when it is available. Measurement using a map is the next most accurate means; estimation should be used as a last resort.

14. Elevation is applied to the gun by means of the QFC and gun controls. To lay the gun for elevation, the gunner:

- a. measures (sight technique) or applies (non-sight or turret-down techniques) the angle of sight to the mils scale;
- b. rotates the range drum adjuster until the range ordered is directly below the cursor line; and
- c. using the elevating hand wheel, levels the bubble in the QFC (ending the lay in depression) and reports "LEVEL".

POSITION OF THE ARMOURED FIGHTING VEHICLE

15. When the fire position of the AFV is such that there is the possibility of a projectile striking a crest to the front, the commander must check crest clearance before a round is fired. This situation usually occurs in a turret-down fire position; however, the commander will commence the fire order with "TURRET DOWN..." if the danger exists that a projectile could strike a crest to the front.
16. When a turret-down shoot is ordered by the commander, he does not load the main armament until the gun has been laid and crest clearance has been checked.
17. Once the gunner has laid the gun initially and reported "LEVEL", the commander looks through the gun barrel from the top of the breech to the bottom of the muzzle. If he can see no obstruction beyond the muzzle, he loads the gun and reports "CREST CLEAR, LOADED, FIRE". The weight of the round will change the balance of the gun and cause the lay to be disturbed. The gunner must relevel the bubble with the gun controls and once again report "LEVEL" before firing.
18. If the commander sees an obstruction when he is checking crest clearance, he reports "CREST FOUL". He must then either abandon the engagement or move the vehicle to a new position where there is less chance of fouling the crest.
19. Crest clearance is checked on the following occasions:
 - a. before firing the initial round of a turret-down shoot;
 - b. for any line corrections;
 - c. for any drop correction below the opening elevation; and
 - d. when in doubt.
20. When a commander expects to occupy a turret-down fire position for a considerable amount of time, he must find the minimum safe range (MSR) at which targets can be engaged.
21. The procedure to find the MSR is as follows:
 - a. The gunner zeroes the QFC scales and the commander opens the breech. Looking along the length of the bore (from the top of the breech to the bottom of the muzzle), the commander orders the gunner to elevate until the crest is just clear. The gun is then traversed through the arc of responsibility. Each time there is an obstruction beyond the muzzle, the gun is elevated until the crest is cleared. In this way the highest point is found at which the crest is clear throughout the arc.

- b. The gunner now levels the bubble in the QFC using the range drum adjuster. He then reads the range setting on the HESH/HE and SMOKE scales showing against the cursor line. This range is passed to the commander, who records it.
- 22. Commanders should go through a crest clearance drill even after MSR has been established.

FIRE ORDERS

- 23. The fire orders for semi-indirect shooting differ somewhat from those for direct shooting.
- 24. There are further differences between fire orders for sight, non-sight and turret-down techniques. These differences can be noted by comparing the techniques which follow.
- 25. **Sight Technique.** The following applies:

- a. The fire order is basically the same as for direct techniques and the information flows in the same order, i.e., weapon/ammunition, range, target description and alignment of the gun.
 - b. Once the gunner has reported "ON", he lays the MBS 76 on the centre of the target and zeroes the traverse indicator. The commander then orders "SET ANGLE OF SIGHT". The gunner then:
 - (1) unlocks the range drum adjuster,
 - (2) levels the bubble in the QFC by rotating the range adjuster,
 - (3) slips the HESH/HE scale until the zero mark is directly below the cursor line,
 - (4) locks the range drum adjuster securely, and
 - (5) reports "SET".
 - c. The commander repeats the range, the gunner acknowledges it, sets the range and levels the bubble using the gun controls, then reports "LEVEL".

- 26. **Non-Sight and Turret Down Techniques.** The following applies:

- a. Because the gunner cannot see the target described, the commander orders the weapon/ammunition (preceded by "TURRET DOWN" in a turret-down technique) and then aligns the gun.

- b. Once the gun is aligned and the traverse indicator is zeroed, the commander orders an angle of sight (or "ZERO SCALES") followed by the range to the target.

CORRECTIONS

27. The corrections that the commander may use to correct semi-indirect fire are:

- a. the commander's line correction; and
- b. the bracketing correction.

28. **Commander's Line Correction.** Due to the effects of drift, the commander must be prepared for line error on the initial round. It is vital that this line error be eliminated quickly. Line corrections are measured in mils by the commander (using his sight or binoculars) and are applied by the gunner to the traverse indicator. If there is any doubt as to whether there is a need for an elevation correction, the commander will correct for line before correcting for elevation.

29. **Bracketing Correction.** The bracketing correction is applied as follows:

- a. If the first round falls plus or minus of the target, a correction is ordered by the commander with the intention of achieving a straddle with the second round. Suggested opening corrections are:
 - (1) up to 3000 m - 200 m or 400 m (usually 200 m),
 - (2) 3000 m to 5000 m - 200 m or 400 m (usually 400 m), and
 - (3) a correction of 100 m may be used if the initial range was measured by a laser range-finder.
- b. If the second round straddles the target, the opening correction is successively halved (in the direction of the target) until either the target is hit or the minimum correction is applied. The minimum corrections are:
 - (1) up to 3000 m - ADD/DROP 25 m, and
 - (2) 3000 m to 5000 m - ADD/DROP 50 m.
- c. If the second and subsequent rounds fail to achieve a straddle, the opening correction (as a minimum) is reapplied until a straddle is obtained. The commander may re-range if the initial error is very large.

FIRE FOR EFFECT

30. Fire for effect is defined as one or more rounds fired to have the desired effect on the target. It is applied on two occasions:

- a. when the target is hit but not destroyed during ranging; and
- b. when the target has not been hit during ranging but the minimum correction has been applied.

31. **Hit During Ranging.** Should the target be struck during the ranging process (i.e., bracketing onto the target) the commander will begin fire for effect and fire at least two more rounds. If the fall of shot is either plus or minus of the target, the commander will add or drop the length of the minimum correction in the direction of the target and fire one round until the target is either struck or the round falls on the opposite side. Having done this, fire for effect will again be applied. The ranging round which originally hit the target constitutes one of the rounds of fire for effect.

32. Once the minimum correction has been applied, smaller corrections cannot be made as they may contradict the minimum correction. Fire for effect is then employed and dispersion should ensure that the target is neutralized.

33. To order fire for effect, the commander orders "LOADED, FIRE" for each round he wishes to be fired. In an area target he may order small line and elevation switches (not less than the minimum correction).

34. During fire for effect, the gunner must ensure that the traverse indicator is at zero, the QFC is correctly set and the bubble is level (ending the lay in depression) before firing each round.

SEMI-INDIRECT SIGHT TECHNIQUE

SITUATION

35. The commander wishes to engage a target with HESH for which the range is greater than 2000m and the gunner can see the target.

TECHNIQUE

36. The commander gives a fire order designating weapon/ammunition, range, target description and aligns the gun then reports "ON".

37. The gunner repeats the range, selects "MAIN", identifies the target and reports "ON". The gunner then lays onto the target with the MBS 76 and zeroes the traverse indicator.

38. If the gunner fails to identify the target, he must report "NOT OBSERVED". The commander could either amplify the target description or switch immediately to the non-sight technique (see paragraphs 49 to 62).
39. Once the gunner has identified the target, the commander orders "SET ANGLE OF SIGHT".
40. The gunner ensures that the MBS 76 is laid on the target and using the QFC, measures the angle of sight. Having locked the range drum adjuster, he reports "SET".
41. The commander repeats the range and the gunner applies it to the QFC by rotating the range drum adjuster until the ordered range on the HESH/HE scale is directly below the cursor line.
42. The gunner then applies elevation to the gun by levelling the bubble in the QFC (using the gun controls) reporting "LEVEL" when level.
43. The commander loads the main armament, makes the loaders's safety switch and orders "LOADED, FIRE".
44. The gunner ensures that his lay is correct, reports "FIRING NOW" and fires. The gunner rezeroes the traverse indicator and releveles the QFC bubble, using the gun controls. He awaits the next order from the commander.
45. The commander observes the fall of shot and orders corrections as necessary, using the commander's line and bracketing corrections (remembering the minimum correction).
46. The gunner repeats the corrections and applies them to the traverse indicator and the QFC. He must ensure that the traverse indicator is zeroed by using the adjustment knobs after each correction is applied.
47. Each time the target is hit, the commander reports "TARGET". This informs the gunner of the progress of the shoot and gives him added incentive to be consistent with subsequent rounds.
48. Once the desired effect has been achieved the commander terminates the shoot by ordering "STOP" or "TARGET, STOP".

SEMI-INDIRECT NON-SIGHT TECHNIQUE

SITUATION

49. The commander wishes to engage a target with HESH. He knows the gunner cannot see the target for one of the following reasons:
- a. inconspicuous target;

- b. poor visibility; or
- c. damage to the gunner's sight.

TECHNIQUE

- 50. The commander gives a fire order designating weapon/ ammunition and aligns the gun himself or, looking along the barrel, orders the gunner to traverse left or right, reporting "ON" when aligned with the target.
- 51. The gunner selects "MAIN" and, using the adjusting knobs, zeroes the traverse indicator once the commander reports "ON".
- 52. The commander orders the angle of sight or, if there is no angle of sight, he orders "ZERO SCALES".
- 53. If the commander orders an angle of sight, the gunner repeats it and applies it to the QFC. The gunner reports "SET" to indicate the completion of this action.
- 54. If the commander orders "ZERO SCALES", the gunner zeroes the scales in the QFC and reports "SCALES ZEROED".
- 55. Having ordered an angle of sight or "ZERO SCALES", the commander orders the range.
- 56. The gunner repeats the range and applies it to the HESH/HE scale by rotating the range drum adjuster until the ordered range is directly below the cursor line. He then applies elevation by levelling the QFC bubble using the gun controls, reporting "LEVEL" when level.
- 57. The commander loads the main armament, makes the loader's safety switch and reports "LOADED, FIRE".
- 58. The gunner ensures his lay is correct, reports "FIRING NOW" and fires. He then rezeroes the traverse indicator and releveles the QFC bubble using the gun controls. He awaits the commander's next order.
- 59. The commander observes the fall of shot and orders corrections as necessary using the commander's line and bracketing corrections.
- 60. The gunner repeats all corrections and applies them to the traverse indicator and the QFC. He must ensure that the traverse indicator is zeroed by using the adjusting knobs after each correction is applied.
- 61. Each time the target is hit, the commander reports "TARGET". This informs the gunner of the progress of the shoot and gives him added incentive to be consistent with subsequent rounds.

62. Once the desired effect has been achieved, the commander terminates the shoot by ordering "STOP" or "TARGET", "STOP".

SEMI-INDIRECT TURRET DOWN TECHNIQUE

SITUATION

63. The commander wishes to engage a target with HESH and the vehicle is in a turret-down fire position.

TECHNIQUE

64. The commander gives a fire order, designating the turret-down warning and weapon/ammunition. Looking along the gun barrel, he orders the gunner to traverse left or right until the gun barrel is aligned with the target and reports "ON".

65. The gunner selects "MAIN" and, using the adjusting knobs, zeroes the traverse indicator when the commander reports "ON".

66. The commander orders the angle of sight or, if there is no angle of sight, he orders "ZERO SCALES".

67. If the commander orders an angle of sight, the gunner repeats it and applies it to the QFC. The gunner reports "SET" to indicate the completion of this action.

68. If the commander orders "ZERO SCALES", the gunner zeroes the scales in the QFC and reports "SCALES ZEROED".

69. Having ordered an angle of sight, or "ZERO SCALES", the commander orders the range.

70. The gunner repeats the range and applies it to the HESH/HE scale by rotating the range from the adjuster until the ordered range is directly below the cursor line. He applies elevation to the gun by levelling the QFC bubble using the gun controls, reporting "LEVEL" when level.

71. The commander does not load when the gunner reports "LEVEL", but will check crest clearance by looking through the gun barrel from the top of the breech to the bottom of the muzzle. If the crest is foul the commander reports "CREST FOUL" and terminates the engagement. If the crest is clear, the commander reports "CREST CLEAR", loads the main armament, makes the loader's safety switch and orders "LOADED, FIRE".

72. The gunner ensures that his lay is correct, reports "LEVEL, FIRING NOW" and fires. He then rezeroes the traverse indicator and releveles the bubble in the QFC using the gun controls then awaits the next order from the commander.

73. The shoot progresses in the same mariner as the sight or non-sight techniques, with the commander checking crest clearance:

- a. for any line correction,
- b. for any drop correction below the initial range, and
- c. when in doubt.

EXAMPLE OF FIRE ORDERS

HESH SIGHT TECHNIQUE

Commander:

74. "HESH, TWO EIGHT HUNDRED,
TRANSPORT RIGHT OF WOOD ... ON"

"SET ANGLE OF SIGHT"

"TWO EIGHT HUNDRED"

"LOADED, FIRE"

"LEFT TWO ZERO, DROP FOUR HUNDRED"

"LOADED, FIRE"

"ADD TWO HUNDRED"

"LOADED, FIRE"

"DROP ONE HUNDRED"

"LOADED, FIRE"

"TARGET"

"LOADED, FIRE"

"TARGET, STOP"

Gunner:

"TWO EIGHT HUNDRED ... ON"

SET"

"TWO EIGHT HUNDRED"

"LEVEL"

"FIRING NOW"

"LEFT TWO ZERO, DROP FOUR
HUNDRED" "LEVEL"

"FIRING NOW"

"ADD TWO HUNDRED"

"LEVEL"

"FIRING NOW"

"DROP ONE HUNDRED"

"LEVEL"

"FIRING NOW"

"LEVEL"

"FIRING NOW"

75. HESH NON-SIGHT TECHNIQUE

Commander:

"HESH ... ON"

"ZERO SCALES"

"ONE NINE HUNDRED"

"LOADED, FIRE"

"RIGHT ONE FIVE, DROP TWO HUNDRED"

"LOADED, FIRE"

"ADD ONE HUNDRED"

"LOADED, FIRE"

"ADD FIFTY"

"LOADED, FIRE"

"ADD TWENTY FIVE"

"LOADED, FIRE"

"TARGET"

Gunner:

"SCALES ZEROED"

"ONE NINE HUNDRED"
"LEVEL"

"FIRING NOW"

"RIGHT ONE FIVE, DROP
TWO HUNDRED" "LEVEL"

"FIRING NOW"

"ADD ONE HUNDRED"
"LEVEL"

"FIRING NOW"

"ADD FIFTY"
"LEVEL"

"FIRING NOW"

"ADD TWENTY FIVE"
"LEVEL"

"FIRING NOW"

"LEVEL"

"LOADED, FIRE"

"FIRING NOW"

"TARGET, STOP"

HESH TURRET DOWN TECHNIQUE.

76. **Commander:**

Gunner:

"TURRET DOWN HESH, TRAVERSE
LEFT, STEADY ... ON, ANGLE OF
SIGHT ONE ONE ELEVATION"

ONE ONE ELEVATION...SET"

"TWO FOUR HUNDRED"

"TWO FOUR HUNDRED...LEVEL"

"CREST CLEAR ... LOADED"

"LEVEL"

"FIRE"

"FIRING NOW"

"LEFT TWO FIVE, ADD FOUR HUNDRED"

LEFT TWO FIVE, ADD
FOUR HUNDRED...LEVEL"

"CREST CLEAR ... LOADED"

"LEVEL"

"FIRE"

"FIRING NOW"

"DROP TWO HUNDRED"

"DROP TWO
HUNDRED ... LEVEL"

"CREST CLEAR ... LOADED"

"LEVEL"

"FIRE"

"FIRING NOW"

"ADD ONE HUNDRED"

"ADD ONE

HUNDRED ... LEVEL "

"LOADED"

"LEVEL"

"FIRE"

"FIRING NOW"

"TARGET... LOADED"

"LEVEL"

"FIRE"

"FIRING NOW"

"TARGET STOP"

CHAPTER 5

SMOKE SHOOTING

GENERAL

INTRODUCTION

1. This chapter deals with smoke shooting. Direct fire cannot be used to fire smoke as the sight graticule pattern does not have markings for this type of ammunition. Semi-indirect techniques are used. These techniques are:
 - a. sight technique;
 - b. non-sight technique; and
 - c. turret down technique.
2. Large-scale smoke screens are best provided by artillery. However, when the commander must fire smoke, he must consider the following:
 - a. the factors that affect semi-indirect shooting;
 - b. the principles of smoke shooting; and
 - c. fuse setting.

FACTORS AFFECTING SEMI-INDIRECT SHOOTING

3. **Establishing Initial Line.** Initial alignment is established in the same manner as HESH semi-indirect shooting. In all cases, the traverse indicator is used to record the line of the gun and to apply line switches.
4. **Position of the Target.** If the target is above or below the AFV, an angle of sight exists and must be applied by the commander. Angles of sight are dealt with in the same manner as for HESH semi-indirect shooting.
5. **Establishing Initial Elevation.** The following applies:
 - a. The range to the target must be established by the most accurate means possible. Once this has been done, a round of HESH can be fired to:
 - (1) confirm the range; and

- (2) observe the effect of wind, turbulence and humidity at the target by watching the effect of the shell burst.

- b. Elevation is applied to the gun using the QFC and gun controls.

6. **Position of the AFV.** If the AFV is in a turret-down fire position, or there is the danger of a projectile fouling a crest, the commander will order "TURRET DOWN" as the first part of the fire order. The turret-down shoot and crest clearance check will proceed as per a HESH semi-indirect turret-down shoot.

PRINCIPLES OF SMOKE SHOOTING

7. The commander must apply the principles of smoke shooting to every smoke engagement.

8. **Speed.** Once the first round of smoke has been fired, any element of surprise has been eliminated. The screen must be quickly built up and maintained for the required period of time. Normally two to three smoke rounds only will be carried in the vehicle so each round must be used to its best advantage.

9. **Position of the Screen.** The position of the screen must be such that it fulfils the requirement of the engagement and does not interfere with other friendly troops.

10. **Point of Origin.** Under ideal wind conditions (12 to 25 km/h) it will take approximately 75 m for the screen to be effective from the point of origin. Variations in wind speed will increase or decrease this distance and the commander must allow for wind speed variation when he selects his point of origin.

FUSE SETTING

11. The 76 mm smoke round is fitted with a No. 390 fuse which must be set by the commander before the round is loaded. The fuse setting key L1A2 is used and the procedure is as follows:

- a. remove the brass cover from the fuse;
- b. place the key on the fuse and engage the knob of the key with the indentation of the setting ring; and
- c. rotate the key clockwise until the required range, which is marked on the key scale, is opposite the line marked SAFE on the fuse.

12. To minimize any time delay in setting and charging fuse settings in a smoke shoot, the commander will adhere to the following drill:

- a. set the initial setting on the first round and load;

- b. select the next round and place it between his legs, set the fuse to the initial setting and keep the key on the round;
- c. make the loader's safety switch and order "LOADED, FIRE";
- d. observe the effect of the smoke and make changes in the fuse setting if necessary or load the next round;
- e. select another round, place it between his legs and set the fuse to the required setting, throw the loader's safety switch and report "LOADED, FIRE"; and
- f. carry on with this drill for all rounds.

CORRECTIONS

13. **Line Correction.** Line error is either estimated or measured by the commander. When it is estimated, the commander orders "TRAVERSE STEADY LEFT/RIGHT" and, when he considers that the gun has moved the required amount, he orders "ON". When it is measured, he will use the commander's line corrections. These are then applied by the gunner using the traverse indicator and gun controls.

14. **Elevation Correction.** The commander estimates the error and may correct it as follows:

- a. change the fuse setting and order a correction in metres to the elevation required;
- b. retain the same fuse setting and order an elevation correction in metres; or
- c. change the fuse setting but retain the same elevation.

SMOKE SCREEN AT CLOSE RANGE USING THE MULTI-BARREL SMOKE GRENADE DISCHARGERS

15. The multi-barrel smoke grenade dischargers (MBSGDs) are fitted to either side of the turret and are designed to provide an immediate screen of short duration.

16. To fire the MBSGDs, the commander traverses the turret to the required position and presses either one or both of the firing buttons as necessary.

SMOKE SIGHT TECHNIQUE

SITUATION

17. The commander wishes to screen a target using main armament smoke. The range is less than 3700 m and the gunner can see the target.

TECHNIQUE

18. The commander gives a fire order designating weapon/ammunition, range, target description, and aligns the gun then reports "ON".
19. The gunner repeats the range, selects "MAIN", identifies the target, reports "ON", lays onto the target with MBS 76 and zeroes the traverse indicator.
20. If the gunner fails to identify the target, he must report "NOT OBSERVED". The commander can either amplify the target description or switch immediately to the non-sight technique.
21. Once the gunner has identified the target, the commander orders "SET ANGLE OF SIGHT".
22. The gunner ensures that the MBS 76 is laid onto the target and, using the QFC, measures the angle of sight. Having locked the range drum adjuster, he reports "SET".
23. The commander repeats the range and the gunner applies it to the QFC by rotating the range drum adjuster until the ordered range is directly below the cursor line (on the smoke scale).
24. Elevation is applied to the gun by the gunner levelling the bubble in the QFC using the gun controls and reporting "LEVEL" when level.
25. The commander sets the fuse, loads the main armament, selects another round and sets the fuse, makes the loader's safety switch and orders "LOADED, FIRE".
26. The gunner ensures that his lay is correct, reports "FIRING NOW" and fires. The gunner then rezeroes the traverse indicator and relevels the bubble in the QFC using the gun controls. He awaits the next order from the commander.
27. The commander observes the effect of the smoke and orders corrections as necessary. Corrections are repeated by the gunner before he applies them.
28. The commander must bear in mind that once the first smoke round has been fired, the screen must quickly be built up and maintained for the required period of time.
29. The commander ends the shoot by ordering "STOP".

SMOKE NON-SIGHT TECHNIQUE

SITUATION

30. The commander wishes to screen a target with main armament smoke. The range is less than 3700 m, and the gunner cannot see the target because:

- a. the target is inconspicuous;
- b. the visibility is poor; or
- c. the gunner's sight is damaged.

TECHNIQUE

- 31. The commander gives a fire order designating weapon/ammunition. He aligns the gun using his gun controller and sight, or looking along the gun barrel, orders the gunner to traverse left or right and reports "ON" when aligned with the target.
- 32. The gunner selects "MAIN" and zeroes the traverse indicator once the commander reports "ON".
- 33. The commander orders the angle of sight, or, if there is no angle of sight, he orders "ZERO SCALES".
- 34. If the commander orders an angle of sight, the gunner repeats it and applies it to the QFC. The gunner reports "SET" to indicate the completion of this action.
- 35. If the commander orders "ZERO SCALES", the gunner zeroes the scales on the QFC and reports "SCALES ZEROED".
- 36. Having ordered an angle of sight or "ZERO SCALES", the commander orders the range.
- 37. The gunner repeats the range and applies it to the smoke scale by rotating the range drum adjuster until the ordered range is directly below the cursor line. He then applies elevation to the gun (using the gun controls) by levelling the bubble in the QFC. The gunner reports "LEVEL" when the bubble is level.
- 38. The commander sets the fuse, makes the loader's safety switch and orders "LOADED, FIRE".
- 39. The gunner ensures that his lay is correct, reports "FIRING NOW" and fires. The gunner then rezeroes the traverse indicator and releveles the bubble in the QFC using the gun controls. He awaits the next order from the commander.
- 40. The commander observes the effect of the smoke and orders corrections as necessary. Corrections are repeated by the gunner before he applies them.
- 41. The commander ends the shoot by ordering "STOP".

SMOKE TURRET DOWN TECHNIQUE

SITUATION

42. The commander wishes to screen a target with main armament smoke at a range of less than 3700m. The vehicle is in a turret-down fire position.

TECHNIQUE

43. The commander gives a fire order designating the turret-down warning and weapon/ammunition. Looking along the gun barrel, he orders the gunner to traverse left or right until the gun barrel is aligned and reports "ON".

44. The gunner selects "MAIN" and zeroes the traverse indicator when the commander reports "ON".

45. The commander orders the angle of sight, or, if there is no angle of sight, he orders "ZERO SCALES".

46. If the commander orders an angle of sight, the gunner repeats it and applies it to the QFC. The gunner reports "SET" to indicate completion of this action.

47. If the commander orders "ZERO SCALES", the gunner zeroes the scales on the QFC and reports "SCALES ZEROED".

48. Having ordered an angle of sight or "ZERO SCALES", the commander orders the range.

49. The gunner repeats the range and applies it to the smoke scale by rotating the range drum adjuster until the ordered range is directly below the cursor line. He then applies elevation to the gun (using the gun controls) by levelling the bubble in the QFC. The gunner reports "LEVEL" when the gun barrel is level.

50. The commander will not immediately load. When the gunner reports "LEVEL", the commander checks crest clearance by looking along the gun barrel from the top of the breech to the bottom of the muzzle. If the crest is foul, he reports "CREST FOUL" and the engagement is terminated. However, if the crest is clear, the commander reports "CREST CLEAR", loads the main armament (having set the fuse, selected another round and sets the fuse on the next round as well), makes the loader's safety switch and orders "LOADED, FIRE".

51. The gunner ensures that his lay is correct for line and elevation, he reports "LEVEL, FIRING NOW" and fires.

52. The gunner rezeroes the traverse indicator and releveles the bubble in the QFC using the gun controls. He awaits the next order from the commander.

53. The shoot progresses in the same manner as a sight or non-sight technique with the commander checking crest clearance as the need arises.

MAIN ARMAMENT EMERGENCY SMOKE

SITUATION

54. The commander wishes to use the main armament to produce an emergency smoke screen.

TECHNIQUE

55. The commander orders "SMOKE" and, using his controller, lays the gun in the direction he wants the screen and reports "ON". The gunner selects "MAIN", then elevates or depresses until the gun is level.

56. The commander sets the fuse to 400, loads the main armament, makes the loader's safety switch and orders "LOADED, FIRE".

57. The gunner reports "FIRING NOW" and fires.

58. The commander must not expose himself as the base plate, which ejects rearward, could cause him injury.

EXAMPLE FIRE ORDERS

EMERGENCY SMOKE TECHNIQUE

Commander:	Gunner:
59. "SMOKE ... ON"	"ON"
"LOADED, FIRE"	"FIRING NOW"
"STOP"	

CHAPTER 6

CANISTER SHOOTING

GENERAL

INTRODUCTION

1. Canister ammunition is designed to break up an attack by massed infantry at close range or to clear thick scrub. Normally a few canister rounds only will be carried on board the vehicle.

MAXIMUM EFFECTIVE RANGE

2. Canister ammunition is limited to a maximum effective range of 150 m.

CANISTER SHOOTING

SITUATION

3. The commander wishes to engage a target with canister at a range of less than 150 m.

TECHNIQUE

4. The commander starts the fire order with "CANISTER", gives a target description or point-of-aim, aligns the gun and reports, "ON".
5. The gunner selects "MAIN", identifies the target, reports "ON" and lays the HESH 1400 m mark onto the target.
6. The commander loads the main armament, makes the loader's safety switch and orders "LOADED, FIRE".
7. The gunner reports "FIRING NOW" and fires.

EXAMPLE FIRE ORDERS

CANISTER SHOOTING

Commander:

Gunner:

8. "CANISTER, LEFT EDGE OF
SCRUB... ON"

"ON"

"LOADED, FIRE"

"FIRING NOW"

"TARGET, STOP"

CHAPTER 7

SHOOTING AT MOVING TARGETS AND SHOOTING ON THE MOVE

GENERAL

INTRODUCTION

1. At times it may be necessary to engage targets which are moving or while on the move. In both cases, there is the possibility that there may be lateral movement between the AFV and the target. The lateral movement must be dealt with to achieve a hit.
2. This chapter covers shooting at moving targets and shooting while on the move.

SHOOTING AT MOVING TARGETS

INTRODUCTION

3. To hit a target moving laterally, it is necessary to aim in front of it or to aim off. The amount of aim-off will differ for each individual target, depending upon speed, time of flight of the projectile and the angle of approach. However, a standard aim-off is used since it is not practical to treat each target individually. Corrections are then made, if required, after the initial round has been fired.

RULES FOR AIMING

4. It is the commander's responsibility to decide whether aim-off is to be applied, and if so, in which direction. Two simple rules govern this decision:
 - a. To decide whether to aim off or to aim on:
 - (1) If the target side is more visible than the front/rear - **aim off**.
 - (2) If the target front/rear is more visible than the side - **aim on**.
 - b. To decide in which direction to aim off:
 - (1) If the gunner is traversing **right** to keep on target - **aim right**.
 - (2) If the gunner is traversing **left** to keep on target - **aim left**.

Having made a decision, the commander includes in his fire order the command "AIM LEFT/RIGHT" or "AIM ON".

5. **Point of Aim.** The correct point of aim is:
- a. **aim-off required** - the initial aim-off mark on the centre of the visible mass; and
 - b. **aim-off not required** - central graticule range mark on the centre of the visible mass.

RANGE LIMITATIONS

6. The range limitations for firing at moving targets are:
- a. HESH:
 - (1) aim-off required - 1500 m, and
 - (2) aim-off not required - 2000 m.
 - b. MG: all cases - tracer burn-out.

CORRECTION OF FIRE

7. To correct onto a moving target, it is especially important that the gunner remember his sight picture in relation to the target itself, not the background. He must also take extra care in assessing the fall of shot since in most cases the target will have moved before he has completed the assessment, effectively removing his reference point. Since the commander cannot effectively monitor the gunner's point of aim during an engagement, the gunner is responsible for correcting fire.
8. When using the initial aim-off marks, the target will be hit only if it is moving within the speed bracket covered by the aim-off mark (15 to 25 km/h, with a margin either side being given by the length of the target). It follows that:
- a. If you miss **right** - **aim further left**.
 - b. If you miss **left** - **aim further right**.
9. Corrections available to the commander and the gunner are the same as those for static targets for both HESH and MG except that the commander's line correction cannot be used. The gunner will employ BOT only when using Radnis on the night mode.

SHOOTING ON THE MOVE

INTRODUCTION

10. Fire from a moving vehicle can never be as consistently accurate as that from a stationary vehicle. For this reason shooting on the move is carried out only under exceptional circumstances and, with the COUGAR, is limited to firing the coaxial MG.

11. As with shooting at moving targets, when there is lateral movement between the target and the AFV, it is necessary to aim off. A standard amount of aim-off is used as it is not practical to treat each target or situation individually.

RULES FOR AIMING

12. As with moving targets, it is the commander's responsibility to determine the need and direction of aim-off. Two simple rules are:

- a. To decide whether to aim off or aim on:
 - (1) if the gun is closer to 3 o'clock or 9 o'clock - **aim off**, or
 - (2) if the gun is closer to 6 o'clock or 12 o'clock - **aim on**.
- b. To decide in which direction to aim off:
 - (1) if the gunner is traversing **right** to stay on target - **aim right**, or
 - (2) if the gunner is traversing **left** to stay on target - **aim left**.

Having made a decision, the commander includes in his fire order the command "AIM LEFT/RIGHT" or "AIM ON".

13. **Point of Aim.** The correct point of aim is:

- a. **aim-off required** - the initial aim-off mark on the centre of the visible mass; or
- b. **aim-off not required** - central graticule range mark on the centre of the visible mass.

RANGE LIMITATION

14. The maximum range for engaging a target while on the move is limited to tracer burn-out.

CORRECTION OF FIRE

15. Only the gunner knows the expected point of impact since only he can see exactly where the aiming mark was in relation to the target at the time of firing. The gunner, therefore, usually corrects fire. It is important that he notes the sight picture at the time of firing so that he may evaluate any errors and apply the necessary corrections.

16. Corrections available to the commander and the gunner are the same as those for normal MG static firing without commander's line correction. Generally speaking, the gunner should remember:

- a. if you miss **right - aim further left**; and
- b. if you miss **left - aim further right**.

17. Should the gunner report "NOT OBSERVED", the commander should order a bold elevation correction (usually a drop correction) followed by "GO ON".

LOADING DUTIES

18. The rules for loading the MG when firing on the move are the same as those for normal loading. During training, however, all stoppage drills must be carried out with the vehicle halted to avoid the risk of injury.

HESH SHOOTING AT MOVING TARGETS

SITUATION

19. The commander wishes to engage a moving target with HESH.

TECHNIQUE

20. The commander gives a fire order designating weapon/ ammunition, range, target description and, having aligned the gun, reports "ON". At this time, he indicates the direction of aim-off by ordering "AIM LEFT/RIGHT" or "AIM ON" as appropriate.

21. The gunner repeats the range, selects "MAIN", identifies the target, reports "ON", and repeats the aim-off. The gunner lays the correct aim-off mark on the target and begins to track, waiting for the order to fire from the commander.

22. The commander loads the main armament, makes the loader's safety switch and orders "LOADED, FIRE".

23. The gunner continues to track the target and, when his lay is correct, reports "FIRING NOW" and fires.

24. The gunner observes the fall of shot, re-lays (continuing to track) and, if the target is hit, reports "TARGET". If the commander considers the target killed, he orders "TARGET, STOP". Should the commander consider, that although hit the target is not killed, he reloads the gun, reports "LOADED" and allows the gunner to fire again at the same lay until he orders "STOP".
25. If the target is not hit, the gunner reports his intended correction and continues to apply corrections until the target is hit or the commander orders "STOP".
26. If the commander agrees with the corrections reported by the gunner, he remains silent. If he disagrees, he orders "STOP" and gives his own correction followed by either "LOADED, FIRE" or "LOADED, GO ON".
27. The gunner, upon hearing the command "STOP", re-lays with his last point of aim and continues to track the target. He repeats the commander's correction, applies it, reports "FIRING NOW" and fires.
28. If the target stops moving the commander will order "STOP, AIM ON, LOADED, GO ON/FIRE". The gunner, on hearing the order to "AIM ON", will repeat it and adjust his lay so that all lead is eliminated and his point of aim is on the centre of the visible mass.
29. If the target changes direction, the commander will order "STOP, AIM LEFT/RIGHT, LOADED, GO ON/FIRE".
30. When engaging more than one target at the same range, the commander orders "TARGET ... NEXT TARGET RIGHT/LEFT ... AIM LEFT/RIGHT, ON ... LOADED, FIRE/GO ON". The gunner reports "ON" when he identifies the target and repeats the aim-off. He lays onto the target with his previous point of aim, and applies the new aim-off ordered by the commander. He continues to track the target until his lay is correct, reports "FIRING NOW" and fires. The gunner continues to correct his fire until the target is hit or he is ordered to "STOP".
31. If the new target is outside the gunner's field of view the commander aligns the gun with the new target (or orders the gunner to traverse left or right) and reports "ON" when he is on target. At this time, he orders the direction of aim-off. The gunner reports "ON" when he has identified the target, repeats the aim-off, begins to track and fires when he is ordered to do so and his lay is correct.
32. The commander ends the shoot by ordering "TARGET, STOP" or "STOP".

MG SHOOTING AT MOVING TARGETS

SITUATION

33. The commander wishes to engage a moving target with the coaxial MG. The range is less than tracer burn-out.

TECHNIQUE

34. The commander gives a fire order designating weapon/ ammunition, range, target description and, having aligned the gun, reports "ON". At this time he orders the direction of aim-off.
35. The gunner repeats the range, selects "CO-AX", identifies the target, reports "ON" and repeats the aim-off. The gunner lays the correct aim-off mark onto the target and begins to track, waiting for the order to fire.
36. The commander ensures that the coaxial MG is loaded, and orders "LOADED, FIRE".
37. The gunner continues to track the target and, when his lay is correct, reports "FIRING NOW" and fires a ranging burst.
38. The gunner observes the trace, re-lays (continuing to track) and, if the target is hit, reports "TARGET". If the commander considers that the target is killed he orders "TARGET, STOP". However, if the commander considers that although hit, the target is not killed, he will remain silent, allowing the gunner to fire a killing burst at the same lay.
39. If the target is not hit, the gunner reports his intended correction and continues to apply corrections until the target is hit or the commander orders "STOP".
40. If the commander agrees with the corrections reported by the gunner, he remains silent. If the commander disagrees, he orders "STOP" and then gives his own correction followed by either "LOADED, FIRE" or "LOADED, GO ON".
41. The gunner, upon hearing the command "STOP", re-lays with his last point of aim and continues to track the target. He repeats the commander's correction, applies it, reports "FIRING NOW" and fires.
42. If the target stops, the commander will order "STOP, AIM ON, LOADED, GO ON/FIRE". The gunner, upon hearing the order "AIM ON", will repeat it and adjust his lay so that all lead is eliminated and his point of aim is on the centre of the visible mass.
43. If the target changes direction, the commander will order "STOP, AIM LEFT/RIGHT, LOADED, GO ON/FIRE".
44. The commander ends the shoot by ordering "TARGET, STOP" or "STOP".

MACHINE-GUN SHOOTING ON THE MOVE

SITUATION

45. The commander wishes to engage a target with coaxial MG fire while on the move. The range is less than tracer burn-out.

TECHNIQUE

46. The commander gives a fire order designating weapon/ammunition, range, target description and, aligning the gun, reports "ON". He then orders the direction of aim-off.
47. The gunner repeats the range, selects "CO-AX", identifies the target, reports "ON" and repeats the aim-off. He lays onto the target with the correct aim-off mark and begins to track the target.
48. The commander loads the MG and orders "LOADED, FIRE".
49. The gunner, when the lay is correct, reports "FIRING NOW" and fires a ranging burst.
50. If the target is hit, the gunner reports "TARGET". If the commander considers the target killed, he ends the engagement by ordering "TARGET, STOP". If he considers that although hit, the target is not destroyed, he remains silent, allowing the gunner to fire successive killing bursts at the same lay.
51. If the target is not hit, the gunner reports his intended correction, re-lays and fires ranging bursts until the beaten zone/cone of fire is on the target.
52. If the commander agrees with the correction reported by the gunner he remains silent. If he disagrees, he orders "STOP" and gives his own correction, followed by either "FIRE" or "GO ON".
53. The gunner, upon hearing the command "STOP", re-lays with his last point of aim and continues tracking. He repeats the commander's correction, applies it, reports "FIRING NOW" and fires.
54. The commander ends the shoot by ordering "TARGET, STOP" or "STOP".

EXAMPLE FIRE ORDERS

HESH - MOVING TARGETS.

55. **Commander:**

"HESH, ONE THOUSAND
TRANSPORT...ON...AIM RIGHT"

"LOADED FIRE"

Gunner:

"ONE THOUSAND...ON
...AIM RIGHT"

"FIRING NOW...ADD ONE
HUNDRED"

"LOADED"

"FIRING NOW ... DROP FIFTY"

"LOADED"

"FIRING NOW...TARGET"

"TARGET STOP"

MACHINE-GUN - MOVING TARGETS.

56. **Commander:**

Gunner:

"CO-AX, SEVEN HUNDRED,
TRANSPORT... ON ... AIM RIGHT"

"SEVEN HUNDRED ON ... AIM
RIGHT"

"LOADED, FIRE"

"FIRING NOW"

"DROP"

"FIRING NOW"

"DROP"

"FIRING NOW"

"TARGET"

"FIRING NOW"

"TARGET"

"TARGET STOP"

MACHINE-GUN SHOOTING ON THE MOVE.

57. **Commander:**

Gunner:

CO-AX, SIX HUNDRED,
MEN IN WOODS...ON...AIM RIGHT

"SIX HUNDRED...ON...AIM
RIGHT"

"LOADED, FIRE"

"FIRING NOW"

"RIGHT"

"FIRING NOW"

"TARGET"

"FIRING NOW"

"TARGET"

"TARGET, STOP"

CHAPTER 8

SHOOTING ON FIXED LINES

GENERAL

INTRODUCTION

1. Shooting on a fixed line implies shooting in a direction and at an elevation that has previously been "fixed" by measurement and/or registration. Such measurements are recorded for subsequent use so that from a given fire position, fire can be quickly and accurately brought to bear onto a point, even though, for reasons of darkness or poor visibility, the target may not be visible at the time of engagement.

REGISTRATION

2. The basis of the shooting on fixed lines technique is the establishment of a zero line from which switches are measured on the traverse indicator to any likely target locations. (The elevation is set by using the ballistic graticule and QFC for ranges up to 2000 m using HESH and the coaxial MG.) The normal non-sight and turret-down techniques may also be used for both HESH and smoke ammunition.

3. The information on line switches, final elevations, quadrant elevations and other relevant information is recorded on a range card. If one target area requires more than one type of weapon/ammunition to be fired, the individual line switch and elevation for each likely nature of weapon/ammunition must be recorded.

4. **Direct HESH Registration.** Using the ballistic graticule and the QFC, direct HESH registration is carried out in the following manner:

- a. The commander selects a distant object to use as the reference point for the zero line (type of object, grid and bearing are recorded on the range card).
- b. A gun aiming point (GAP) is placed in line with the distant object, ensuring that the gunner will be able to lay onto it during all conditions of visibility.
- c. The commander picks a likely target area and, as accurately as possible, measures the range (using a laser range-finder or a map).
- d. The commander orders the gunner to lay onto the GAP with the MBS 76 and zeroes the traverse indicator. To do this the commander orders "ZERO".
- e. The commander gives a fire order designating the weapon/ammunition, range, target description and aligns the gun.

- f. The gunner repeats the range, selects "MAIN", identifies the target, reports "ON" and lays onto the target with the sight graticule mark that corresponds to the range.
- g. If the situation allows, the commander then orders the gunner to fire and correct until the fall of shot hits the intended location.
- h. When the commander is satisfied that the gunner's lay will produce a hit, he will:
 - (1) order the gunner to read off both the amount and direction of the line switch and record it on the range card;
 - (2) order the gunner to level the bubble in the QFC by rotating the range drum adjuster; and
 - (3) when the bubble is level, have the gunner read off the quadrant elevation (the reading on the mils scale directly below the cursor line) and record both the amount and direction on the range card.

5. **Co-axial MG Registration.** This is carried out in the same manner as for HESH. However, the commander should fire ranging bursts to more accurately establish the true quadrant elevation. He should also bear in mind any effects of wind.

6. **Smoke or HESH Registration (over 2000 m).** The commander determines quadrant elevation based on the range to the target plus or minus any angle of sight. Initial line must take into account any drift of ammunition, which can be found using Range Tables.

FIXED LINE SHOOTING

SITUATION

7. The commander wishes to engage a target, which he has previously registered with HESH or coaxial MG. Due to conditions of poor visibility, neither the commander nor the gunner have the capability to see the target.

TECHNIQUE

- 8. The commander designates the weapon/ammunition and orders "ZERO".
- 9. The gunner selects "MAIN" or "CO-AX" and lays onto the GAP with the MBS 76, zeroes the traverse indicator using the adjusting knobs and reports "ZERO".
- 10. The commander orders a line switch.

11. The gunner repeats the line switch and, using the gun controls, traverses in the direction the amount ordered. Once the line switch has been applied, he rezeroes the traverse indicator using the adjusting knobs.
12. The commander orders a quadrant elevation and the gunner sets this on the QFC.
13. The gunner then applies elevation to the gun (using the gun controls) by levelling the bubble in the QFC and reports "LEVEL" when the gun barrel is level.
14. The commander may then order either "LOADED, FIRE" or "LOADED, STANDBY, MAKE SAFE" and order "FIRE" when he is ready.
15. If the commander orders "STAND BY, MAKE SAFE", he will make safe the 76 mm gun (and the MG) while the gunner sets the gun selector switch to the "OFF" position and puts the locking bar up, reporting "GUN SAFE" when he has done so.
16. Before subsequent rounds are fired, the gunner must recheck his lay ensuring that the bubble is level and that the traverse indicator has been zeroed using the gun controls.

EXAMPLE FIRE ORDERS

HESH - FIXED LINE (BALLISTIC GRATICULE AND QFC REGISTRATION)

Commander:	Gunner:
17. "HESH, ZERO"	"ZERO"
"RIGHT ONE TWO FIVE"	"RIGHT ONE TWO FIVE"
"QUADRANT ELEVATION TWO SIX ELEVATION"	"TWO SIX ELEVATION"
	"LEVEL"
"LOADED, STAND BY, MAKE SAFE"	"GUN SAFE"
"LOADED"	
"FIRE"	"FIRING NOW"

"TARGET... LOADED, FIRE"

"FIRING NOW"

"TARGET, STOP"

CHAPTER 9

TROOP SHOOTING

GENERAL

GENERAL

1. Targets which require a large volume of fire either to neutralize or destroy them are usually tasked to the artillery. There may be occasions, however, when artillery support is not available and AFV fire must be used. The method of doing this involves troop shooting where the fire of two or more AFVs is directed onto a target under the control of the troop leader. Troop shooting uses either the direct or the semi-indirect technique, depending on the range to the target.

FIRE DISCIPLINE

2. A troop shoot may be a deliberate engagement or a quick-action engagement. In both cases, the troop leader is responsible for controlling fire. Crew commanders will observe and correct the fire of their own AFVs.

3. Control is maintained by radio or hand signals. However, the volume of radio traffic, the tactical situation and the dispersion of vehicles will dictate which is to be used.

POSITION OF ARMoured FIGHTING VEHICLES

4. During a deliberate engagement the troop leader will direct each vehicle into a suitable fire position and locate his own AFV centrally for control. The distance between vehicles will depend on the tactical situation and the means of control.

5. During a quick-action engagement, when speed is essential, each crew commander will be responsible for positioning his own AFV; however, he should remain within view of the troop leader.

TROOP SHOOTING

DELIBERATE ENGAGEMENT

6. The deliberate engagement is usually done from a turret-down fire position and consists of four stages:

- a. target indication;
- b. ranging;

- c. registration; and
- d. fire for effect.

7. **Target Indication.** Once all AFVs are in position, a fire order will be issued designating ammunition, range and target description. If an angle of sight is required, this will be included in the troop leader's fire order. All crew commanders then attempt to locate the target. If the COUGAR is in a turret-down position, commanders will immediately apply the angle of sight and the range to their QFCs.

8. **Ranging.** After target indication is complete the troop leader will range to the centre of the target. He may, if he wishes, nominate another AFV for this task. All other commanders will use the fall of shot to identify or confirm the target to their gunners and establish initial line. Once on target, they will carry on with proper fire orders and await registration. The ranging crew commander will adjust fire until he hits the target or a subsequent correction would hit the target.

9. **Registration.** The final elevation (as determined by the ranging vehicle) is passed to the remaining AFVs and is applied to the guns. One round registration is now fired at five second intervals in order of call sign. Registration is complete when the centre of the target is hit or a subsequent correction would bring the next round on target. This is usually a silent correction passed to the gunner following agreement or correction from the troop leader.

10. **Fire for Effect.** If the ranging vehicle hits and destroys the target during ranging, the engagement is stopped. Should a volume of fire be required over a period of time, then one of the following types of fire will be used:

- a. **Gun Fire.** In this case, the number of rounds specified by the troop leader are fired as soon as the gun can be loaded and accurately laid. It ensures a large volume of fire is brought to bear in as short a time as possible.
- b. **Troop Fire.** In this case, a number of rounds are fired at five second intervals in order of call sign. The time interval may be extended by an order from the troop leader. This type of fire is used for the adjustment of each vehicle's fire or to spread fire for effect over a period of time.

QUICK-ACTION ENGAGEMENT

11. In a quick-action engagement, there is no time available for all AFVs to register. In this case, the troop leader or a designated tank will range and report the final elevation to the remaining AFVs. Normally gunfire will then be used to ensure the maximum number of rounds are brought to bear in the least amount of time.

12. The procedure followed by the remaining AFVs is exactly the same as for a deliberate engagement except that registration does not take place.

DISTRIBUTION OF FIRE

13. During a deliberate or quick-action engagement, the troop leader may wish to distribute fire. Upon completion of registration in a deliberate shoot, the troop leader distributes his fire from the centre of the target since this is where all vehicles are registered. During the quick action engagement, fire is distributed from the last ranging round as all call signs are registered for line on this point.

EXAMPLE FIRE ORDERS

DELIBERATE ENGAGEMENT.

14. **Commander:**

Call Signs:

"ALL STATIONS 14, THIS IS 14,
TROOP HESH, ANGLE OF SIGHT
TWO DEPRESSION, TWO FOUR
HUNDRED, PLATOON DUG IN ON
CREST, OVER"

"14A ROGER OUT"

"14B ROGER OUT"

"14C ROGER OUT"

"ALL STATIONS 14, THIS IS 14 FINAL
ELEVATION, TWO SIX HUNDRED,
REGISTER, STAND BY OUT"

"14A READY OUT"

"14B READY OUT"

"14C READY OUT"

"ALL STATIONS 14 THIS IS 14,
REGISTER NOW OUT"

"14 THIS IS 14A
REGISTERED OVER"

"14 ROGER OUT"

"14 THIS IS 14B
REGISTERED OVER"

"14 ROGER OUT"

"14 THIS IS 14C FROM
LAST SHOT RIGHT FIVE,
ADD FIFTY, REGISTERED
OVER"

"14 WRONG, FROM LAST SHOT
ADD ONE HUNDRED, REGISTERED OVER"

"14C ROGER OUT"

NOTE

If the troop leader wishes to have the correction he has made confirmed by fire, he will report: "WRONG, FROM LAST SHOT ADD ONE HUNDRED, FIRE, OVER".

"ALL STATIONS 14, THIS IS 14. THREE ROUNDS
GUN FIRE, STAND BY, OUT".

NOTE

If the troop leader wishes to distribute fire, he can do so at this time.

Commander:

Call Signs:

"ALL STATIONS 14, THIS IS 14.

14A, RIGHT TWO-FIVE ADD FIFTY.

14B, RIGHT TWO-FIVE ADD ONE HUNDRED.

14C, LEFT ONE ZERO, DROP FIFTY.

THREE ROUNDS GUN-FIRE, STAND BY, OUT"

"14, THIS IS 14A, READY OUT".

"14, THIS IS 14B, READY OUT".

"14, THIS IS 14C, READY OUT".

Troop Leader:

"ALL STATIONS 14, THIS IS 14, FIRE, OUT"

Call Signs:

"14, THIS IS 14A,
ROUNDS COMPLETE, OUT"

"14, THIS IS 14B,
ROUNDS COMPLETE, OUT"

" 14, THIS IS 14C,
ROUNDS COMPLETE, OUT"

NOTE

The troop leader may order troop fire during fire for effect to determine which vehicle is off target.

"ALL STATIONS 14, THIS
IS 14. ONE ROUND TROOP FIRE, STAND BY, OUT"

"14, THIS IS 14A, READY OUT"

"14, THIS IS 14B, READY OUT"

"14, THIS IS 14C, READY OUT"

"ALL STATIONS 14, THIS IS 14, FIRE, OUT"

"14C, RIGHT ONE-FIVE, ADD FIFTY,
THREE ROUNDS GUN-FIRE, STAND BY, OUT"

NOTE

The troop shoot then continues as a normal shoot.

QUICK-ACTION ENGAGEMENT

15. "ALL STATIONS 14, THIS IS 14.
TROOP HESH, ONE NINE HUNDRED,
PLATOON IN TREE LINE
THREE ROUNDS GUN-FIRE,
STAND BY, WATCH MY FIRE, OVER"

"14A, ROGER OUT"

"14B, ROGER OUT"

"14C, ROGER OUT"

"ALL STATIONS 14, THIS IS 14.
FINAL ELEVATION TWO THOUSAND
THREE ROUNDS GUN-FIRE, NOW, OUT"

NOTE

The troop leader may distribute fire if he wishes.

REFERENCES

1. The following publications are related to, and should be read in conjunction with, this manual:
 - a. B-GL-304-003/TS-001, Operational Training, Volume 3, Ranges and Training Safety;
 - b. B-GL-305-007/MS-002, Armour, Volume 7, COUGAR User Manual, Part 2, Armament;
 - c. B-GL-305-009/PT-001, Armour, Volume 9, Theory of Armoured Gunnery, Part 1, General;
 - d. B-GL-305-012/PT-001, Armour, Volume 12, Indoor Armoured Range Simulation Practices;
 - e. B-GL-305-013/PT-001, Armour, Volume 13, Armour Open Range Practices; and
 - f. B-GL-050-ARM/PT-002 (AC 70197), Eye Training for Crews of AFVs.
2. There are no relevant NATO STANAGs or ABCA QSTAGs.